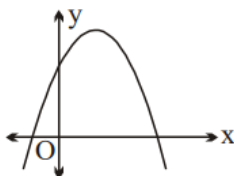


DPP-2

SINGLE CORRECT TYPE

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1. The graph of a quadratic polynomial $y = px^2 - qx + r$ is as shown in the adjacent figure, then



(A) $r^2 - 4q < 0$

(B) $r^2 - 4p < 0$

(C) $p + q > 0$

(D) $r - p - q > 0$

Ans. (D)

Sol. $r > 0$; $p < 0$ & $q < 0$. Now verify it.

2. If the graph of $f(x) = x^2 + (3 - k)x + k$ (where $k \in \mathbb{R}$) lies above and below x -axis, then k cannot be

(A) -1

(B) 0

(C) 1

(D) 10.

Ans. (C)

Sol. $f(x) = x^2 + (3 - k)x + k$ lies above and below x -axis

$$D > 0$$

$$(3 - k)^2 - 4k > 0$$

$$9 + k^2 - 6k - 4k > 0$$

$$k^2 - 10k + 9 > 0$$

$$(k - 1)(k - 9) > 0$$

3. The smallest integral value of p for which the inequality $(p - 3)x^2 - 2px + 3(p - 2) > 0$ is satisfied for all real values of x , is.

(A) 8

(B) 7

(C) 6

(D) 5

Ans. (B)

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Sol. We have, $(p - 3)x^2 - 2px + 3(p - 2) > 0$ is true for all $x \in \mathbb{R}$, so

$$p - 3 > 0 \quad \dots\dots(i)$$

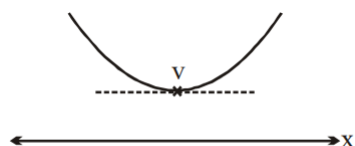
$$\text{and } \text{Disc.} < 0 \quad \dots\dots(ii)$$

must be satisfied simultaneously.

$$\therefore p > 3 \quad \dots\dots(1)$$

$$\text{and } D < 0 \Rightarrow 4p^2 - 4(p - 3)(3p - 6) < 0$$

$$f(x) = (p - 3)x^2 - 2px + 3(p - 2)$$



$$\Rightarrow 2p^2 - 15p + 18 > 0$$

$$\Rightarrow 2p^2 - 12p - 3p + 18 > 0$$

$$\Rightarrow 2p(p - 6) - 3(p - 6) > 0$$

$$\Rightarrow (2p - 3)(p - 6) > 0$$

$$\Rightarrow p > 6 \text{ or } p < \frac{3}{2} \quad \dots\dots(2)$$

$$\therefore (1) \cap (2) \Rightarrow p \in (6, \infty)$$

Hence, the smallest integral value of p equals 7.

4. The largest integral value of k for which the quadratic trinomial $P(x) = (k - 2)x^2 + 8x + k + 4$ is non-positive for all real values of x is

(A) 2

(B) 4

(C) -6

(D) -2

Ans. (C)

Sol. $(k - 2) \cdot x^2 + 8x + (k + 4) > 0$

$$\text{Here } b^2 - 4 \cdot a \cdot c = 0.$$

$$(8)^2 - 4 \cdot (k - 2) \cdot (k + 4) = 0$$

$$\text{or } (k - 2)(k + 4) = 16.$$

$$\text{or } k^2 + 2k - 8 - 16 = 0.$$

$$\text{or } k^2 + 2k - 24 = 0$$

$$\text{or } (k + 6)(k - 4) = 0.$$

$$k = -6 \text{ or } 4$$

$$K > 4$$

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MULTIPLE CORRECT TYPE

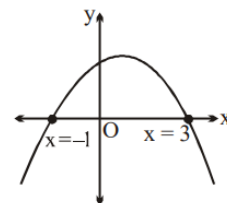
5. Consider the graph of quadratic polynomial $y = ax^2 + bx + c$ as shown below. Which of the following is(are) correct?

(A) $\frac{a-b+c}{abc} = 0$

(B) $abc(9a+3b+c) < 0$

(C) $\frac{a+3b+9c}{abc} < 0$

(D) $ab(a-3b+9c) > 0$



Ans. (A, C)

Sol. $a < 0, c > 0$. Also, $\frac{-b}{2a} > 0 \Rightarrow b > 0$

So, $abc < 0$

Also, $f(-1) = a - b + c = 0$ and $f(3) = 9a + 3b + c = 0$

Clearly, $f\left(\frac{1}{3}\right) > 0 \Rightarrow \frac{a}{9} + \frac{b}{3} + c > 0$

$\Rightarrow a + 3b + 9c > 0$

Also $f\left(-\frac{1}{3}\right) > 0 \Rightarrow \frac{a}{9} - \frac{b}{3} + c > 0 \Rightarrow a - 3b + 9c > 0$

Now, verify alternatives

6. If S is the set of all real 'x' such that $\frac{x^2(5-x)(1-2x)}{(5x+1)(x+2)}$ is negative and $\frac{3x+1}{6x^3+x^2-x}$ is positive, then S contains

(A) (1, 4)

(B) (5, 11)

(C) $\left(-\frac{3}{2}, \frac{-1}{2}\right)$

(D) (-10, -4)

Ans. (A, C)

Sol.

INTEGER TYPE

7. Let $f(x) = x^2 + px - 2$, $g(x) = px^2 + x + (p+2) \forall x \in \mathbb{R}$, where p is a real constant.

If $f(x) > g(x) \forall x \in \mathbb{R}$, then the range of p is $\left(-\infty, \frac{m}{n}\right)$ where m and n are coprime.

Find the value of $(m - 5n)$.

Ans. 2

Sol.

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8. Let $x^2 + 2y^2 - 2xy - 2 \geq k(x + 2y) \quad \forall x, y \in \mathbb{R}$, then find the number of integral values of k .

(A) 3

(B) 2

(C) 4

(D) 0

Ans. (D)

Sol. $x^2 - (2y + k)x + 2y^2 - 2ky - 2 \geq 0$

We need to have coefficient of $x^2 > 0$ and Discriminant of given quadratic $D < 0$

$$D = (4)y^2 + (-4k)y + (9k^2 - 8) < 0$$

$$(2y - k)^2 + (8k^2 - 8) < 0$$

$$k \in \phi$$

9. If the roots of the equation

$x^2 + (p + 1)x + 2q - q^2 + 3 = 0$ are real and unequal $\forall x, p \in \mathbb{R}$ then find the minimum integral value of $(q^2 - 2q)$

(A) 3

(B) 2

(C) 4

(D) 0

Ans. (C)

Sol.